SAMPLE COLLECTOR

BACKGROUND OF THE INVENTION

This invention relates to sample collectors.

In one class of sample collector, a series of discrete volumes of liquid are collected within separate containers from a larger body of liquid for later analysis. They are collected by a pumping system that pumps samples from the liquid being monitored and deposits each of the samples into a different container.

In the prior art sample collectors of this class, the volume of each sample is controlled by depositing the sample in a separate measuring container and then emptying the container after the container is filled to a fixed volume or else controlling the amount of time or the number of strokes of the pump from the start of pumping until the liquid has been deposited into a sample collector or a combination of these two techniques.

The prior art systems have several disadvantages such as: (1) when a separate container is used, the opportunities for contamination are increased and the apparatus tends to be more complicated and expensive; and (2) when time or number of strokes are counted from the beginning of the sampling period, the volume varies under some circumstances with the viscosity of the fluid being pumped, with the escape of air and with similar variables.

SUMMARY OF THE INVENTION

It is an object of the invention to provide a novel sample collector.

It is a further object of the invention to provide a sample collector which accurately measures the volume of solids.

It is a still further object of the invention to provide a relatively simple sample collector.

It is a still further object of the invention to provide a sample collector in which the volume of the sample is measured starting at a time after the sample has reached a predetermined position in the sample line.

In accordance with the above and further objects of the invention, the sample collector includes a continuous flexible conduit mounted to cooperate with a peristaltic pump to pump samples from a body of liquid into containers. Apparatus is provided for moving one end of the conduit from container to container at preselected intervals of time.

To measure a preprogrammed amount of liquid into a container, an optical sensor is positioned adjacent to the continuous conduit to detect the interface of the liquid and to provide a signal. The number of strokes of the peristaltic pump are counted and controlled from the time of detection of the signal in accordance with the programmed volume, after which the direction of pumping is reversed to clear the conduit.

The optical sensor advantageously includes a source of light and a light sensor on opposite sides of the continuous conduit, where the liquid interface interrupts the light from the source to generate a signal indicating the interface. The light source may be a light-emitting diode and the sensor may be a phototransistor.

This sample collector has the advantages of: (1) utilizing a single continuous conduit which reduces contamination possibilities; (2) being relatively simple and inexpensive since it does not require a separate measuring container and a means for distributing the liquid into and out of that measuring container; (3) providing accuracy by counting of the strokes of the pump when the liquid interface reaches a point in the conduit between the pump and the container into which the liquid is to be deposited.

SUMMARY OF THE DRAWINGS

The above noted and other features of the invention will be better understood from the following detailed description when considered with reference to the accompanying drawings, in which:

FIG. **1** is a perspective view of a sample collector in accordance with an embodiment of the invention;

FIG. **2** is an exploded perspective view of the sample collector of FIG. **1**, partly broken away to show internal structure;

FIG. **3** is a simplified fragmentary perspective view of a portion of the embodiment of FIG. **1**;

FIG. **4** is a cross section view of a portion of the embodiment of FIG. **1**;

FIG. **5** is a simplified fragmentary view of a portion of the sample collector of FIG. **1**; and

FIG. **6** is a block diagram of a circuit forming a portion of the embodiment of FIG. **1**.

SPECIFIC DESCRIPTION

In FIG. **1**, there is shown a liquid sample collector **10**, having a generally cylindrical base **12**, a cylindrical cover **14** fitted to the base **12** and an intake conduit **16** in the form of a tubular intake hose extending through and depending downwardly from an opening **18** in the upper portion of the base **12**.

The base **12** includes a sample bottle tub **20**, and a control section **22** positioned to overlie the sample bottle tub **20** and to receive the cover **14**. The cover **14** is removably attached to the control section **22** by a plurality of conventional latching mechanisms **26**, and the control section **22** is similarly attached to the sample bottle tub **20** by a plurality of latching mechanisms **26**.

The sample collector **10** is supported in a suitable position in vicinity of a body of liquid being monitored. The control section **22** includes three cable-harness attaching eyelets **30** (two of which are shown in FIG. **1**) to receive the hook of a removable cable harness **32** by which the sample collector **10** may be lowered such as through a manhole or otherwise manipulated and positioned for use.

Prior to operation, the sample collector **10** is programmed to draw liquid at fixed intervals from a body of liquid and deposit the sample drawn after each interval into a different container. Time intervals are set for it to draw a sample or a flow meter may be included in the stream to measure the volume of liquid flowing past a point and initiate the collecting of a sample after that volume of liquid has flowed past the meter. In addition to setting the intervals for taking samples, the volume of the sample taken may be set.

In operation, after the sample collector **10** has been set for predetermined intervals and for the volume of each sample, samples are periodically drawn through the intake conduit **16** and deposited in containers. During the taking of a sample, a liquid interface detector within the sample collector detects the liquid and causes the strokes of the pump to be counted to the predetermined number of counts corresponding to the volume. During this counting, the liquid is deposited in a selected container and then the pump reverses to drive